

I claim:

1.

1 An anhydrous ammonia fertilizer flow control apparatus comprising;
2 a separation chamber, for separating gaseous ammonia from liquid
3 ammonia including a head space in a top end of a separation chamber, a quieting
4 section in the separation chamber below the top end, and a stand pipe;
5 the top end of the separation chamber includes a gaseous ammonia
6 discharged valve that is open to discharge gaseous ammonia from the separation
7 chamber and that is closed in response to the level of liquid ammonia reaching a
8 selected liquid height within the separation chambers;
9 the quieting section includes an entry passage, with an entry
10 passage area transverse to a flow direction, for receiving a mixture of gaseous
11 ammonia and liquid ammonia from an ammonia storage tank and wherein the
12 quieting section has a quieting section area, perpendicular to a flow of liquid
13 ammonia through the quieting section, that is at least two times the entry passage
14 area to slow the velocity of gaseous ammonia and liquid ammonia and permit the
15 gaseous ammonia to separate from liquid ammonia and rise into the head space;
16 the stand pipe includes a stand pipe upper end connected to a
17 downstream end of the quieting section, a stand pipe lower end and a stand pipe
18 ammonia exit passage spaced below the head space; and
19 a liquid ammonia pump connected to the stand pipe ammonia exit
20 passage.
21

2.

1 An anhydrous ammonia fertilizer flow control apparatus, as set forth
2 in claim 1, wherein the gaseous ammonia discharge valve includes a valve body,
3 a spool holder support attached to the valve body and having a spool passage
4 with an open first passage end, an open second passage end and a gas exit
5 passage intersecting the spool passage;

6 a spool slidably mounted in the spool passage for sliding movement
7 between an open position in which the gas exit passage is open and a closed
8 position in which the gas exit passages closed; and

9 a float connected to the spool and operable to slide the spool to a
10 closed position in response to a decrease in the volume of the gas in the head
11 space.

3.

1 An anhydrous ammonia fertilizer control apparatus, as set forth in
2 claim 2, wherein the float is connected directly to the spool and the spool moves
3 with the float as the level of liquid ammonia in the separation chamber moves up
4 and down.

4.

1 An anhydrous ammonia fertilizer flow control apparatus, as set forth
2 in claim 3, wherein the spool slides in the spool passage along a generally vertical
3 path.

5.

1 An anhydrous ammonia fertilizer flow control apparatus, as set forth
2 in claim 1, including a manifold attached to a pump outlet of the liquid ammonia
3 pump and a plurality of flexible hoses each of which is connected to the manifold
4 and to one a plurality of nozzles that inject ammonia into the ground.

6.

1 An anhydrous ammonia fertilizer flow control apparatus, as set forth
2 in claim 5, wherein each of the plurality of nozzles is mounted on an earth working
3 tool that forms a slot in the ground.

7.

1 An anhydrous ammonia fertilizer flow control apparatus, as set forth
2 in claim 6, wherein the earth working tool is a knife mounted on an applicator
3 frame.

8.

1 An anhydrous ammonia fertilizer flow control apparatus, as set forth
2 in claim 1, wherein the stand pipe has a stand pipe ammonia flow path cross-
3 section area that is smaller than the quieting section area.

9.

1 An anhydrous ammonia fertilizer apparatus comprising
2 an applicator frame adapted to move across a farm field;
3 a plurality of soil working tools mounted on the applicator frame;
4 a gaseous ammonia separation chamber attached to the applicator
5 frame and including a head space, in the top end of the gaseous ammonia
6 separation chamber, a quieting section and a stand pipe;
7 a gaseous ammonia discharge valve, mounted on the top end of the
8 gaseous ammonia separation chamber, that is opened to discharge ammonia gas
9 from the gaseous ammonia separation chamber and that is closed in response to
10 the level of liquid ammonia reaching a selected liquid height within the separation
11 chamber;
12 an entry passage, for receiving a mixture of gaseous ammonia and
13 liquid ammonia from an ammonia storage tank, through a quieting section wall,
14 and wherein the quieting section has a diameter that is at least twice the diameter
15 of the entry passage;
16 a stand pipe upper end attached to a discharge end of the quieting
17 section and a stand pipe discharge opening through a stand pipe lower end and
18 wherein the stand pipe discharge opening is spaced below the head space a
19 distance sufficient to create a static head that maintains an ammonia pressure at
20 the discharge opening that is above the anhydrous ammonia saturation pressure;
21 an ammonia liquid pump connected to the stand pipe discharge
22 opening;

23 a manifold attached to a pump discharge of the ammonia liquid
24 pump for dividing pump discharge into a plurality of separate ammonia streams
25 with substantially equal flow rates; and
26 a plurality of hoses each having one end connected to the manifold
27 and a discharge end connected to a nozzle supported by the applicator frame
28 adjacent to one of the soil working tools.
29

10.

1 An anhydrous ammonia fertilizer apparatus, as set forth in claim 9,
2 wherein ammonia gas discharged from the gaseous ammonia discharge valve is
3 conveyed by a gas conveyor hose attached to a valve discharge port and injected
4 into the ground through a gas nozzle supported by the applicator frame adjacent
5 to one of the soil working tools.

11.

1 A method of applying anhydrous ammonia fertilizer to farm fields
2 comprising:
3 supplying saturated ammonia in a storage tank;
4 employing the pressure generated by the saturated ammonia at a
5 vaporization temperature to force ammonia gas and ammonia liquid into a
6 separation chamber;
7 separating ammonia gas from the mixture of ammonia gas and liquid
8 in the separation chamber;

9 removing ammonia gas from the separation chamber to reduce
10 pressure in the saturation chamber and to control a gas head volume separation
11 chamber;
12 employing an ammonia liquid head to maintain a pump inlet
13 pressure of above a saturation pressure of the ammonia;
14 pumping ammonia to a manifold and metering the ammonia from the
15 manifold through orifices;
16 conveying the ammonia from the manifold through flexible hoses to
17 a plurality of ammonia injection nozzles; and
18 injecting the ammonia into the soil.
19

9 removing ammonia gas from the separation chamber to reduce
10 pressure in the saturation chamber and to control a gas head volume in the
11 separation chamber;
12 employing an ammonia liquid head to maintain a pump inlet
13 pressure of above a saturation pressure of the ammonia;
14 pumping ammonia to a manifold and metering the ammonia from the
15 manifold through orifices;
16 conveying the ammonia from the manifold through flexible hoses to
17 a plurality of ammonia injection nozzles; and
18 injecting the ammonia into the soil.
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